



STORAGE RESEARCH INFRASTRUCTURE ECO-SYSTEM

RI Information sheet 2022

Organisation, RI name

Technology(ies) of Energy Storage (that can be assign to the facility, e.g. electrochemical, chemical, thermal, cross-cutting, ...)

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Project Acronym	StoRIES
Call	H2020-LC-GD-2020
Grant Agreement No.	101036910
Project Start Date	01-11-2021
Project End Date	31-10-2025
Duration	48 months

1. Photo

...



2. Geographical coordinates (°, ′, ... N/S, E/W)

63.41620420306699, 10.404214304259312 : **Site 1**

63.40205200853979, 10.39838637633008 : **Site 2** (Sept. 2022 commissioning)

3. Description of the research infrastructure for the webpage

The Bat-Lab infrastructure at SINTEF Industry covers the value chain of battery manufacturing from materials synthesis to pouch cell assembly, including electrochemical characterization and long-term testing.

Wet chemistry laboratories, high temperature synthesis facilities, flame spray pyrolysis, and hydrothermal autoclaves are available for lab/batch-scale **materials synthesis**. Furthermore, access to Argon glove boxes and facilities for **electrode fabrication** and **cell assembly**, such as thinky mixers, tape casting, electrode calendaring or spray coating, can be granted.

The Bat-Lab at SINTEF Industry also includes a mini-assembly line for multilayer pouch cells with a maximum capacity of 600-800 mAh, 50*50mm (Figure 1).

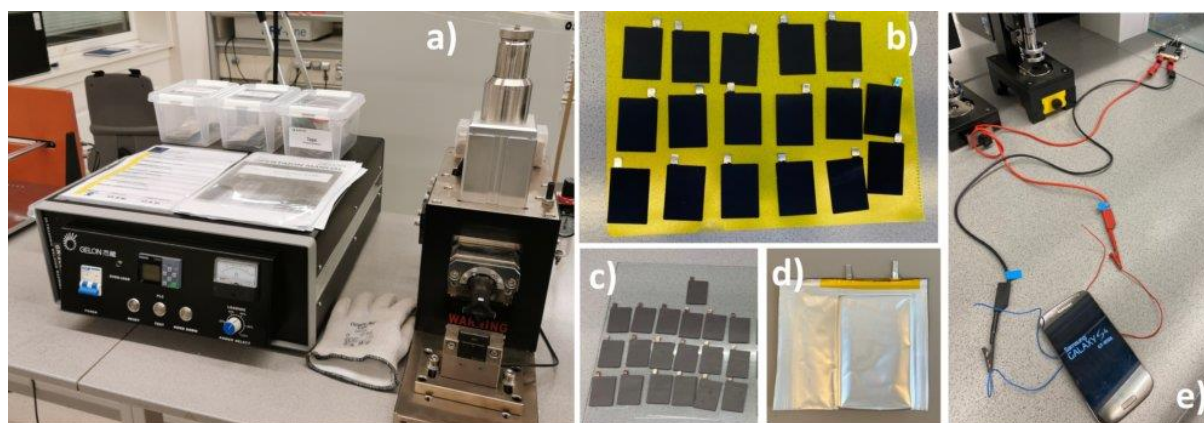


Figure 1. (a) Pouch cell welder, (b) cathode sheets, (c) anode sheets, (d) pouch cell, and (e) battery test powering a Samsung Galaxy.

The **testing facility** consists of approximately **140 battery test channels** (soon to be more than doubled), including AC impedance (EIS) modules, and temperature- and humidity-controlled testing chambers. Table 1 shows an overview of the battery cyclers and potentiostats currently available at SINTEF Industry.

Besides testing capabilities, our battery lab is equipped with state-of-the-art ink blending facilities such as overhead blenders, ball mills, high speed mixers and a centrifugal vacuum mixer. We also host rheometers (Anton-Paar) for slurry and ink analysis. In addition, we have advanced test cells for electrolyte studies by RHD Instruments, as well as an Ofelia test cell, Figure 2, to analyse thickness changes of solid-state electrolytes or electrode materials in operando (electrochemical dilatometer, T control -40 °C to 100 °C). The **electrochemical characterization facility** consists of several potentiostats/galvanostats for AC testing, chronoamperometry, linear sweep and cyclic voltammetry.

Table 1. Overview of the current Bat-Lab testing facility.

Instrument	Nr. of channels	Max current/potential	EIS
1) Coin cells testing:			
Landt Instrument Battery Test System	<ul style="list-style-type: none"> • 16 • 96 • <u>80</u> • <u>80</u> 	<ul style="list-style-type: none"> • 2mA/5V • 10mA/5V • <u>100mA/5V</u> • <u>5A/5V</u> 	N
BioLogic BCS 805	8	150mA/5V	Y
2) Small pouch/cylindrical cells testing:	-	-	-
BioLogic VMP-300	16	400mA/5V	Y
• <i>Current Booster</i>	• 2	• 2 A	-
• <i>Current Booster</i>	• 2	• 20 A	-
• <i>Current Booster</i>	• 1	• 150 A	-
BioLogic BSC 815	8	15A/5V (120A, stacked channels)	Y
3) High Energy Cells testing:			
PEC ACT0550	20	50A/5V (1000 A, stacked channels)	N





Figure 2. Ophelia cell with gauge meter for thickness variation measurements

Services currently offered by the infrastructure:

SINTEF offers a complete battery assessment from fundamental materials science investigation (electrochemical and physical-chemical characterization) to full cell development and optimization (battery testing and modelling, lifetime prediction). We have expertise in:

- Battery materials development and characterization
 - Cathode, anode, electrolyte, and separator
 - Electrochemical characterization and modelling
 - Physical-chemical characterization
- Cell development and characterization
 - Battery cell assembly (coin, pouch, and 3-electrode cells)
 - Cell testing (cylindrical, pouch, and prismatic) and lifetime prediction
 - Post-mortem analysis

SINTEF also holds competence relating to raw materials required for battery cell production, optimization of production technology, including automation and digitization, as well as recycling and reuse after end of battery life. We have a broad portfolio of battery projects and activities which range from fundamental

and multi-scale modelling to advanced structural and electrochemical characterization and development of novel materials for next-generation Li-ion batteries (Generations 3a-3b and 4). Our research interests also include the development post-Li, metal air, multivalent ion batteries (SEAMAG project).

SINTEF coordinates the EU Horizon 2020 funded project HYDRA which focuses on the development of Generation 3b Li-ion batteries, combining high-capacity anode materials with high-voltage cathode materials. Furthermore, we are a partner in BATTERY 2030+, and in the project BIG-MAP, leading the development of the Battery Interface Ontology and supporting the investigation of new materials with advanced atomistic simulations.

Services & infrastructure in the delivery and installation phase:

In August 2022 Sintef Industry has a planned launch of a 140m² Dry room with a dew point of -40 °C. In this space will be located a semi-automatic pouch cell assembly line, a pilot line coater with a 2-meter-long drying oven, 40ton hot calender, and conventional mixing equipment from leading European suppliers. Accompanying the new Dry room will be lab space that will house a coater, battery cyclers (6V 30A/60A), formation equipment, test chambers, gloveboxes, rheometer, electrode characterization equipment, twin screw-extruder, and wet lab space.

The primary cell size produced in the new lab will be a 195*78mm pouch cell.

Services to be offered from January 2023 will include:

- Slurry Rheology development.
- Double sided coating of electrodes.
- Cell assembly and development.
- Cell components validation and testing
- Cyclic aging
- Calender aging

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4. Availability of the research infrastructure



(Please indicate time periods in which infrastructure will not be available for StoRIES in the next 2 years – if already known)

Site 1 is available from September 2022

Site 2 will be available from Jan 2023

Both sites are closed over Easter and Christmas seasons as well as Public Norwegian Holidays.

5. Special considerations (confidentiality / NDA agreements, insurance requirement, special training, HSE training)

All visiting users of the infrastructure are required to sign a personal non-disclosure agreement with SINTEF, be covered by adequate insurance, undergo a standard HSE course, and must receive specific training on the labs and infrastructure to be used.

6. Energy storage technology that can be analysed/studied by using the research infrastructure

- Electrochemical
- Chemical
- Thermal
- Mechanical
- Superconducting Magnetic
- Cross-cutting (Specifically: ...)

7. Key words for the webpage

SINTEF Battery Lab , SINTEF, SINTEF Industry, Norway

8. TRL level (if applicable):

- 1-3
- 4-6
- Above